How 'global' are investment banks? An analysis of investment banking networks in Asian equity capital markets

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ABSTRACT
This paper examines the distribution of power within financial networks of investment banks in equity capital markets (ECMs) of three key economies in Asia—Hong Kong, Japan, and Singapore. Using social network analysis, it shows that while bulge-bracket banks occupy core positions in all three locations, their dominance is challenged by emerging Asian investment banks. The ECM networks of investment banks are strongly shaped by development trajectory and regional contexts of specific IFCs, which reveals the differentiated nature of finance across Asia. Results also highlight the need for further research on networks within financial centres in addition to inter-city networks to understand the roles and development of IFCs.

KEYWORDS
Investment banks, equity capital markets, power, networks, financial centres, Asia

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INTRODUCTION

The agglomeration of financial activities in international financial centers (IFCs) and global city networks have been a key feature of geographical research on global economic flows and key nodes in global finance (Sassen, 2001; Taylor & Derudder, 2016). Studies on world city networks utilise sophisticated analyses of interlocking advanced business services (ABS) firm networks, to determine the positionality and status of cities within transnational networks, which in turn shape their roles and trajectories. The network positions of cities are calculated based on firm size and functions (such as headquarters, regional headquarters, branches or subsidiaries, number of employees) to determine the power of cities in the world economy. This approach, however, focuses on the connections *between* cities rather than the processes and relationships operating *within* those cities in shaping their power and positions. We argue for the need to understand the roles and importance of IFCs in terms of actual processes and relationships operating within those cites in order to develop a more grounded and substantive understanding of IFCs as strategic places for different types of financial firms (Taylor et al., 2014).

In this paper, we examine whether the distribution of power within financial networks follow similar or distinct patterns. Our focus on this question is motivated by the observation that, should the distribution of power vary between IFCs, understanding the causes of such variation would contribute to the knowledge of changing roles and capacities of IFCs in terms of local development and regional dynamics, and not just in terms of their positions in inter-city networks (c.f. Taylor & Derudder, 2016). Furthermore, according to existing research in financial geography, economic sociology, and varieties of capitalism literatures (Brenner et al., 2010; Dixon, 2011; Streeck & Thelen, 2005), we should find distinct patterns of power distribution—patterns that reflect developmental trajectories and regional geographies, and patterns that highlight the territorial dimensions of seemingly global financial networks (Coe

et al. 2014). We examine this hypothesis by focusing on financial networks of investment banks in equity capital markets (ECMs) of three prominent IFCs in Asia—Hong Kong, Japan, and Singapore.[1] Studies on world cities have noted a discernible shift from west to east over the past two decades, in terms of increasing network connectivity of key cities from emerging economies, especially China (Derudder & Taylor, 2016; Pan et al., 2018). The rising importance of Asia in global financial networks is also noted by Wojcik et al. (2018) in terms of the growth of Japanese and Chinese investment banks amidst the overall shrinkage of investment banking activities after the 2008 global financial crisis. Our study of financial networks within these three prominent IFCs in Asia therefore extends those preliminary observations with a richer account that further develops our understanding of the geographies of finance in Asia. We analyse the networks of investment banks as they play important roles in shaping financial flows and connecting key actors in global capital markets (Wojcik et al., 2018).

If trajectories of local development and regional context matter in shaping financial activities, we should find significant differences in the positions and power of different types of investment banks, in particular the highly global bulge-bracket investment banks that dominate international finance. We operationalise this argument by using social network analysis (SNA) to examine the power of social actors through the patterns of relations they form (Wasserman & Faust, 1994). Within SNA, we employ a cutting-edge technique called cohesive blocking (Moody & White, 2003), which enables us to identify the power of particular investment banks within financial networks.

Studies on investment banks tend to focus on their firm size (e.g., firm capitalisation, number of employees), business value (e.g., size and value of deals, fees and revenue

[1] ECM transaction data from Dealogic are collected at the national level rather than city level. Given that Tokyo dominates ECM activities in Japan, this is still a reasonable proxy for examining the relative power and characteristics of Hong Kong, Singapore and Tokyo as financial centres.

generated), and international reach (e.g., locations of regional headquarters and branches). However, from a sociological perspective, these measures do not sufficiently capture the nature of relationships between investment banks and the different positions of power within the industry. The key to measuring the power of investment banks in a network lies in ranking different banks based on how resilient they are to the removal of other banks with whom they transact. The firms that are more resilient to the removal of their partners are embedded more deeply in a financial network, since resilience is possible only by forming relations with multiple other firms. Higher embeddedness, in turn, implies a greater degree of power. This follows from two complementary definitions of power in sociology. First, drawing from the Weberian definition of power (Weber 1978, pp. 53-54), Organisation A that has access to a greater number relations compared to Organisation B has greater control over information and resource flows compared to B. Second, following Emerson's theory of power-dependence relations (Cook & Emerson, 1984; Emerson, 1962), Organisation A's power over Organisation B increases proportionally with the number of alternative relations that provide similar means for achieving A's goals.

Hence, the more deeply embedded a financial organisation is in the network, the more central and powerful that organisation is within that industry (Moody & White, 2003; Uzzi, 1999). At the extreme, we find core-periphery networks. Such financial networks are dominated by a handful of banks that appear as a 'core' with dense ties among each other, while peripheral actors feature sparse connections among each other. As a result, peripheral actors have to rely on the core group for access to resources and deals (Borgatti & Everett, 2000; Mani & Moody, 2014). Hence, the greater the contrast between central and peripheral groups in a financial network, the more central groups dominate that particular industry. Social networks in the real world rarely exhibit clear core-periphery patterns. Instead, one finds networks formed by multiple 'layers' that are differentially embedded. As we explain

below, cohesive blocking is an indispensable tool to uncover the different layers of embeddedness in a network.

In line with the argument outlined above, we expect the historical development and regional context of a particular IFC to influence the positions of different investment banks (bulge-bracket, middle-market, and boutique, as discussed below). The historical development of the banking sector and regional context of finance in Hong Kong, Singapore, and Japan show considerable variation. In Hong Kong, we find a truly international finance sector that historically placed few limits on the activities of foreign financial intermediaries. However, greater integration of Hong Kong with Chinese financial markets since the early 1990s has resulted in a heterogenous and highly competitive market. In Singapore, we find a relatively smaller regional hub, albeit one where domestic banks—purposefully nurtured by the state—have become competitors to global firms. Japan offers a strong contrast to both Hong Kong and Singapore, as the Japanese banking and finance industry is highly consolidated and presents formidable barriers to entry for foreign institutions. As such, we expect the position of different types of investment banks to reflect these factors.

Thus, we offer a structural analysis on the power of investment banks, which explains network positions through developmental trajectories and regional context. We complement the structural analysis of large financial networks with insights from 50 interviews conducted with investment bankers in Singapore, Hong Kong, mainland China and Japan.[2] Although our understanding of the industry and the geographical contexts of key Asian financial centres are informed by these interviews, the evidence presented in this paper focuses on quantitative structural analysis in order to investigate the power of investment banks, as indicated by the embeddedness of investment banks within such networks.

[2] Majority of the 50 interviews were conducted face-to-face, with four interviews conducted over telephone, and lasted between 30 to 60 minutes. Respondents range from associates and directors to regional managers and country heads. Interviews in mainland China were conducted in Mandarin while the rest were in English.

This research design enables us to address several gaps in the existing literature on investment banking and IFCs. Within the geography literature, research on investment banking has largely focused on working practices (Jones, 2003; Hall, 2007), elite workers (Cook et al., 2007), and intersections with financial crises (Christophers, 2009; Wójcik et al., 2017). Both the relationships amongst investment banks themselves and how their locations in key financial centres result in particular industry configurations remain poorly understood. Existing studies focus on headquarter functions and branch locations rather than transactional relationships and the distribution of power within such networks (Leyshon et al., 2008; Taylor & Derudder, 2016; Yeung et al., 2017). The literature on IFCs mirrors this lacuna, as it focuses on IFCs as centres of command and control in the organisation of the world economy as well as major sites of production for finance and specialised services (Sassen, 2001; Cassis & Wojcik, 2018). Research on IFCs draws upon a network approach in terms of how flows of information, labour, and capital between IFCs shape the overall global financial architecture (Faulconbridge, 2004; Lai, 2012; Wojcik, 2013). The agglomeration of financial activities in IFCs and the nature of inter-city networks have been well-documented (Sassen, 2001; Cook et al., 2007; Taylor et al., 2014; Bassens & van Meeteren, 2015; Taylor & Derudder, 2016). However, there is limited research on the structure of financial networks *within* these cities, what that might reveal about those IFCs as strategic places for specific types of financial firms, and whether such financial networks signal opportunities or limitations for IFC development.

In economic sociology and organisational studies, there is also limited research on the social structure of the finance industry and the distribution of power among financial intermediaries. Although one of the fundamental objectives of new economic sociology has been to understand how networks coordinate economic activities (Powell, 1990) and how power plays a fundamental role in shaping organizational networks (Cook & Emerson, 1984),

there are few such studies on financial networks (Chuluun, 2015; Pollock et al., 2004; Shipilov, 2006). Given the importance of relationships in shaping business practices and industry structure, particularly in a crucial segment like investment banking, this is an important lacuna.

Accordingly, we make several contributions to the existing literature. First, our arguments on the relationship between developmental trajectories, regional context, and network position of different investment banks connect the literatures on IFCs and financial geography to economic sociology and social network analysis. Second, we probe into a new and potentially fruitful line of inquiry, one that investigates how path-dependent institutional and geographical factors shape networks within IFCs. Third, our findings on different power configurations in leading Asian financial centres provide important evidence that substantiate initial observations of increasingly important Asian cities in global financial networks (Derudder & Taylor, 2016; Pan et al., 2018; Wojcik et al., 2018).

DEVELOPMENTAL TRAJECTORIES AND REGIONAL CONTEXT

Although banking has long been important to Singapore's development as a trading hub, sophisticated investment banking activities grew significantly only in recent decades. The early history of banking was dominated by smaller family-owned banks that mostly conducted deposit-taking and trade financing for domestic and trade activities, although larger foreign banks were present due to colonial trading interests. After independence in 1965, there was concerted government effort to attract financial institutions for developing new financial markets and products (Woo, 2016). The establishment of the Asian Dollar Market in 1968 was a milestone, and 1970s through to 1980s saw steady entry of investment banks from the UK, USA, Canada and Germany. The next milestone came during banking liberalisation in 1999-2004, known as the Singapore 'Big Bang'. Liberalisation measures

included a new category of Qualifying Full Bank (QFB) licenses to foreign banks, increasing the number of restricted banks, giving offshore banks greater flexibility in Singapore Dollar wholesale business and lifting foreign shareholding limit in local banks. All these created competitive pressures on local banks and led to the consolidation of numerous local banks into three larger entities (DBS, UOB and OCBC) (Lai & Daniels, 2017). After mergers and business restructuring, the enlarged local banks shifted from traditional loan intermediation into capital markets services and expanded into the Asian regional markets. At the same time, the banking liberalisation enabled foreign investment banks to increase their product offerings and capabilities in Singapore and created a substantive investment banking sector. While the small domestic market offers limited opportunities, the regional Southeast Asian market (and the Chinese market to some extent) present significant opportunities as firms in the growing economies of Thailand, Indonesia, Malaysia, India and Vietnam seek M&A, equity and debt solutions.

Hong Kong's transformation from a small entrepot to an eminent financial centre is largely attributed to the openness of the former British colony and the full convertibility of its currency (Jao, 1997; Schenk, 2002). These two factors also led to a much more liberalised banking environment, in which local and foreign banks could operate freely in terms of identifying suitable types of banking products and niche markets that best suit their capabilities and business strategies. Although a three-tier bank licensing system was introduced in 1990 to improve systemic stability, the early presence of many foreign banks and their historical networks meant that most of them continued to operate at the top tier of 'Licensed Banks' (with full range of banking activities). After the 1997 handover, the 'One country, two systems' principle allowed the Hong Kong dollar to continue circulating as a convertible and separate currency and enabled Hong Kong to serve as a vital gateway for capital flows in and out of China (Meyer, 2000; Jao, 1997). The deep capital markets in Hong

Kong, strong legal environment and regulatory framework, and access to a wide pool of investors through the global networks of investment banks made it particularly attractive for mainland Chinese companies seeking IPOs and secondary listings (Lai, 2012). However, the preference for local Hong Kong or Chinese investment banks (or securities firms) is also due to language, familiarity with business cultures, and mainland regulatory requirements. There is therefore a more diverse range of industry players, with bulge-bracket banks, large established Hong Kong banks and Chinese securities firms appealing to different types of firms and equity issues.

The post-war development of Japan's financial markets was characterised by the strong role of the Ministry of Finance (MOF) through three aspects of Japanese political economy (Hori, 2005). First, there was close cooperation between the ruling Liberal Democratic Party (LDP) and MOF since 1955. Second, prominent Japanese banks exercised relationship banking through cross-shareholding and long-term commitment to major firms (Arikawa & Miyajima, 2007; Vogel, 2006). Third, competition in many industries, including finance, was 'managed' to promote efficiency, cooperation, and commitment to economic development. The Japanese financial industry in the 1980s was segmented into city banks, trust banks, regional banks, Shinkin banks, and credit cooperatives (Park, 2012). By the late 1990s, the cooperative relationship between LDP and MOF broke down following prolonged deleveraging in the private sector and a series of financial intermediary failures (Hori, 2005). The 1997 Asian financial crisis then precipitated a wave of reforms known as the Japanese financial 'Big Bang' (Toya, 2006), which led to a wave of bank mergers. As a result, Japanese mega-banks (in particular Mitsubishi UFJ Financial Group, Mizuho Financial Group, and Sumitomo Mitsui Financial Group) command an overwhelming share of the Japanese capital markets, with dominant positions in corporate finance in addition to comprehensive domestic branch networks. High saving rates further increase the financial

power of Japanese mega-banks since they capture the lion's share of private and corporate deposits through their commercial branch networks. The highly consolidated banking industry makes Japan a difficult place for foreign financial institutions. The biggest challenge for foreign banks is their lack of distribution networks within the highly consolidated banking landscape in Japan.

Given the above observations, we expect Japan to exhibit the greatest degree of power concentration, followed by Hong Kong and Singapore. This is because Japanese mega-banks command an overwhelming share of the Japanese capital markets with dominant positions in corporate finance (Arikawa & Miyajima, 2007; Vogel, 2006). Moreover, Japan is a net source of capital but not a regional conduit or recipient of finance capital, which limits the role of foreign investment banks as intermediaries (Stowell, 2012). The ECM landscape in Japan, therefore, presents opportunities for only the largest bulge-bracket firms who could leverage on their global distribution networks to connect Japanese clients with international investors. In contrast, Hong Kong is a highly liberal IFC with little historical differentiation between local and foreign banks. Its role as a gateway for capital flows into (and later on, out of) China present significant opportunities for various financial intermediaries (Jao, 1997; Meyer, 2000), such as bulge-bracket banks, large established Hong Kong banks and Chinese securities firms appealing to different types of firms and equity issues (Lai, 2012). Compared to Hong Kong, we expect Singapore ECM network to be less diverse and dominated by a smaller number of bulge-bracket and regional banks. This is due to the small domestic ECM market coupled with emerging opportunities in the regional Southeast Asian market.

EQUITY CAPITAL MARKETS AND INVESTMENT BANK NETWORKS

Investment banks provide advice and management services for complex financial transactions and capital creation for corporations, organisations, and governments. Two main activities are

underwriting (for debt financing and issuance of equity securities) and mergers and acquisition (M&A). Investment banks are generally categorised into bulge-bracket, middle-market and boutique firms (Bruce & Foerster, 2013). In general, bulge-bracket banks are industry leaders whether in terms of deal value, firm size, and global networks. The likes of Goldman Sachs, Morgan Stanley and Credit Suisse work on the largest deals from transnational corporations and have the most recognised names in the investment banking world.[3] Middle-market banks work on smaller deals with more regional focus (e.g., North American or Asian activities and client networks) or industry specialisation (e.g., agri-food or energy). Boutique investment banks have fewer employees with localised presence and tend to specialise in specific segments (such as M&A) or industries (e.g., healthcare).[4]

During an IPO or other equity issuance, one or a group of investment banks act as underwriters to handle documentation and reporting requirements, liaise with potential investors to market the offering and gauge interest, and offer guarantee to purchase a minimum number of securities themselves. A *bookrunner or lead manager* is the main underwriter who coordinates the information and workflow of other underwriters and advanced business services (ABS) firms (e.g., law, accounting, and consultancy firms), and determine how the new issue would be divided among all underwriters. Our focus is on the roles and positions of investment banks in these ECM networks, particularly those who act as bookrunners or lead managers, as these are positions of power in shaping various aspects of the ECM deal, such as the appointment of other underwriters and ABS firms, proportion of fees allocated to different underwriters, deal structure, and marketing strategies.

[3] In this paper, we identify the top 10 bulge-bracket banks as commonly used by industry participants (from interviews and industry websites); namely J.P. Morgan, Goldman Sachs, Citi, Bank of America Merrill Lynch, Morgan Stanley, Deutsche Bank, Barclays, Credit Suisse, UBS and HSBC.

[4] There is a small group of elite boutique banks with substantive international network and strong reputations comparable to bulge-bracket banks.

METHODOLOGY AND DATA

We utilise a commercial dataset on ECM transactions provided by Dealogic, one of the industry leaders in financial data services. In our analysis, we focus on three categories of transactions: IPO, follow-on (FO) issues, and debt instruments convertible to shares, for a three-year period between 2013-2015.[5] In these transactions, we examine relationships built through underwriting activities by focusing on the most prominent roles that involve substantial interaction between investment banks: bookrunner, lead manager and global co-ordinator. We include all the transactions whose target market is Japan, Hong Kong or Singapore, regardless of the nationality of the firm, as transactions with investment banks, ABS firms, and regulators are conducted locally. Thus, the bookrunner for an American firm listing in Singapore Exchange is included in our analysis. We also include all transactions involving a firm already listed in a particular financial centre, since such transactions are highly likely to involve banks operating in that financial centre, regardless of the target market for the transaction. Following standard procedures in SNA, we build our relational dataset from the raw financial data pertaining to transactions (see Appendix).

The cohesive-blocking technique ranks social groups—blocks in the SNA terminology—in a network by social solidarity, measured by the degree of *group cohesion* (Moody & White, 2003). For instance, in a group of 10 connected actors, if the group they form remains connected after the removal of any 3 actors but becomes disconnected with the removal of 4 actors, that indicates a level of social solidarity of 4. The higher this number is, the higher is the level of social solidarity. Empirical research in SNA shows that social groups are often nested in a group with a higher degree of social cohesion, which can be found by examining whether a group with higher degree of cohesion exists after removing the

[5] This follows standard procedures in SNA and prevents unusual results from any particularly large equity issue in a single year (Chuluun, 2015). For robustness checks, we have also conducted the analysis for 2- and 4-year periods, which confirmed our key findings.

actors that disconnect the social group (Moody & White, 2003). As weakly connected actors are removed from a group, nested social groups with higher degree of cohesion emerge. Accordingly, groups with lower degree of cohesion are *embedded* in groups with higher degree of cohesion (Granovetter, 1985). Thus, one can assign an embeddedness score to particular groups in a social network.[6] Moody & White (2003) provide strong evidence that the embeddedness score is a good predictor of subjective relations (e.g., attachment) as well as behavioural patterns (e.g., political contributions). Furthermore, embeddedness revealed through cohesive blocking analysis is also aligned with another key notion in SNA — *centrality* — which measures prominence in a network. Groups and actors embedded at deeper levels occupy key positions in the social network. Because the cohesive blocking technique is not sensitive to the weight of ties (i.e., transaction value in ECM networks), we supplement our analysis with weighted betweenness centrality measures, which capture the extent to which an underwriter might occupy a bridging position between pairs of other underwriters. When weighted by deal value, investment banks with a high betweenness centrality score enjoy a structural advantage as their network positions provide opportunities for acting as intermediary or gatekeeper (Freeman, 1978).

In addition to cohesive blocking analysis, our comparison of different investment banking networks relies on two additional SNA measures: *density* and *transitivity*. Density is the proportion of actual ties to all possible ties (Wasserman & Faust, 1994). Transitivity, or clustering coefficient, is an indicator of the 'cliquishness' of a network (Watts & Strogatz, 1998); it captures the degree to which nodes in a network cluster together.[7] A high clustering coefficient combined with centrality in a dense financial network indicates that bookrunners at the centre of the network are likely to form groups where they have a high number of

[6] Please see Appendix for more detailed explanation.
[7] We use the ratio of closed triples to connected triples as the measure of clustering coefficient (Csárdi & Nepusz, 2006; Wasserman & Faust, 1994).

mutual connections among each other, which increases the power gap between such a group and the rest of the bookrunners outside that group.

We present our results with a novel visualisation algorithm (Gemici & Vashevko, 2018). We first show the group that is at the lowest level of social cohesion as a square. Then we find the group with higher cohesion nested within this group. We show this nested group as a square nested within the parent group. The region between two squares contains firms that are connected to the parent group but become disconnected from the child group with higher degree of social cohesion. We repeat this process until we reach the core of the network, where we find the group with the highest degree of social cohesion. This technique reveals which groups are at the centre or periphery of a financial network, and which bookrunners are more deeply embedded. In each figure, the numbers associated with a social group indicate the embeddedness score and the degree of cohesion.

When examining a social network, it is possible that we get different 'branches' in the network as we decompose it through cohesive blocking. The organisations that hold together these distinct groups are called *bridge organisations*, and they are also important in understanding the flow of resources in a network through strategically connected banks. We also show which banks act as bridges.

FINDINGS

The ECM networks we present show the roles and connections of investment banks in each location, which banks are in the core groups (i.e., the most deeply embedded banks with greater access to resources and deals in that network) and periphery groups, and their relative importance within that industry network. These signify their power in shaping the structure of ECM deals, appointment of ABS firms, allocation of fees, and access to potential investors. We find considerable variation in the structure of financial networks in Japan, Hong Kong,

and Singapore. The Japanese case, as predicted, reveals a financial network where almost all power is concentrated in Japanese megabanks and bulge-brackets. Hong Kong presents a sharp contrast to Japan, as the distribution of power in the network is much more heterogeneous. In Singapore, we find a network where Singaporean banks with significant activities in the surrounding region occupy powerful positions alongside bulge-brackets. These results are aligned with our initial expectations. However, they also reveal other important actors and relationships in the ECM networks of key Asian IFCs.

The ECM networks in Japan (Figure 1) are unusual because there are only two levels with a 13-member clique at the core. Two types of financial intermediaries form this core group: bulge-bracket banks and Japanese megabanks. Bulge-bracket banks such as Goldman Sachs, Barclays, J.P. Morgan, and Deutsche Bank—North American and European powerhouses—are densely connected to Japanese megabanks. Every firm in the 13-member clique is as central as the other firms because all firms are connected to each other. However, there are some marked differences in the identities of bookrunners in different types of deals.[8] Bulge-bracket firms tend to be listed as bookrunners in deals oriented toward international investors and they are often featured as global co-ordinators. Japanese banks tend to be sole bookrunner in deals oriented toward the domestic market. These findings confirm our expectations as the dominance of Japanese mega-banks across capital markets, corporate finance and retail banking creates significant barriers to entry for foreign banks. As banks like Mitsubishi UFJ, Mizuho and Sumitomo Mitsui command an overwhelming share of the Japanese market, this industry landscape presents opportunities for only the largest bulge-bracket banks who could leverage on their global distribution networks to capture ECM deals oriented towards international markets (Interviews: JP1, JP5, JP7, September 2016).

[8] Dealogic database provides extensive details on deal characteristics, which we use in interpreting the network analysis results.

Japan (2013-2015)

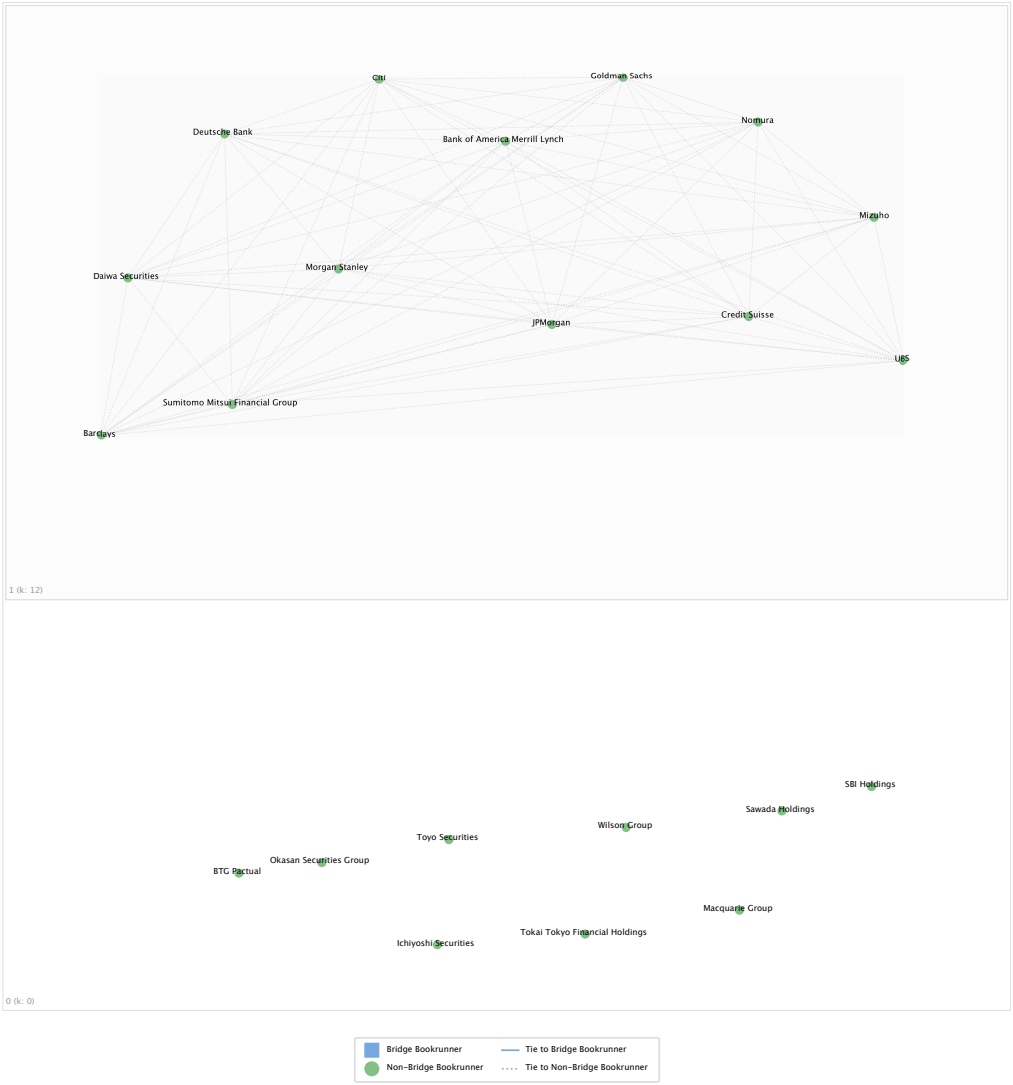

Figure 1: Cohesive blocks of bookrunners in Japan, 2013-15

Table 1: ECM transactions in Singapore, Hong Kong and Japan, 2013-2015

Measure	Hong Kong	Japan	Singapore
Number of deals	1683	777	275
Number of bookrunners	221	22	68
Number of ties	1314	78	121
Average number of bookrunners per deal	1.69 (1.94)	1.5 (1.26)	1.49 (0.9)
Maximum number of bookrunners per deal	22	13	6
Density	0.054	0.33	0.053
Transitivity (clustering coefficient)	0.61	1	0.51

Note: Numbers in parentheses are standard deviations.
Source: Authors' calculations based on Dealogic data.

Perhaps the strongest evidence of the level of consolidation in Japanese ECM networks is the classic core-periphery pattern. As suggested in the introduction, clear core-periphery patterns are rare in real-world social networks. They arise only when there is polarisation between a group that controls all flows and peripheral actors that are dependent on the core group for access to resources and flows in the network. That is precisely what we find in Japan. A handful of Japanese megabanks and bulge-bracket banks monopolize almost all the major IPO and follow-on deals, and smaller banks have a presence in this market solely through transactions that involve small and medium-scale enterprises. Density and transitivity measures offer further evidence of the concentration of power in Japanese mega-banks and select bulge-bracket banks (Table 1). The Japanese ECM financial network is perfectly clustered with a level of density (0.33) much higher than Hong Kong and Singapore, which reflects a much higher number of mutual connections among banks inside the core group compared with other banks in the ECM network. Given that the number of bookrunners in Japan is far fewer than in Hong Kong and Singapore, despite the relatively

high number of deals brokered in Japan, these findings further accentuate the high concentration of power in Japanese mega-banks and selected global bulge-bracket banks.

As the largest equity market in Asia, the cohesive blocks for Hong Kong are much more complex in terms of embeddedness levels and number of banks involved (Figure 2a). Multiple layers of embeddedness coupled with a dense core in Hong Kong indicate centralisation by the bookrunners at the core of the ECM network, despite significant activity captured by actors that lie outside the core. Most bulge-bracket firms have long business history in Hong Kong and feature very prominently in the ECM market, accounting for 78.44% of total deal value.[9] However, a different picture emerges when we analyse network ties and structure, with Hong Kong and mainland Chinese investment banks occupying significant positions in the industry network. The inner core layers in Figure 2b contain a surprisingly large number of Hong Kong and mainland Chinese firms alongside bulge-bracket banks. Moreover, many of these firms play significant roles as bridge bookrunners. These Chinese firms, such as Emperor Capital Group and GF Securities, are vital in connecting a vibrant periphery of bookrunners (levels 2, 3, 4, and 5) to the core groups. Compared to Japan, the industry network in Hong Kong has a more diverse array of financial intermediaries and greater differentiation in the network structure. The deep capital markets in Hong Kong, strong legal and regulatory frameworks, and access to a wide pool of investors have made Hong Kong particularly attractive for mainland Chinese companies seeking IPOs and secondary listings. While this presents valuable opportunities for global bulge-bracket banks with their expertise and international distribution networks (interviews: HK5, HK6, July 2016), there are also multiple factors that mitigate the power of bulge-brackets. The characteristics of many Chinese companies, especially state-owned enterprises that are encouraged to list overseas as 'national champions' (Lai, 2012; Wojcik & Camilleri,

[9] All calculations are based on Dealogic ECM data.

2015), lead to a preference for local Hong Kong or Chinese financial intermediaries due to lower fees, language, business culture, and regulatory requirements on the mainland (interviews: CN5, CN6 CN9, July-August 2016). This could explain the diverse range of industry players. Thus, bulge-bracket banks, large established Hong Kong banks, and Chinese securities firms appeal to different types of clients and equity issues.

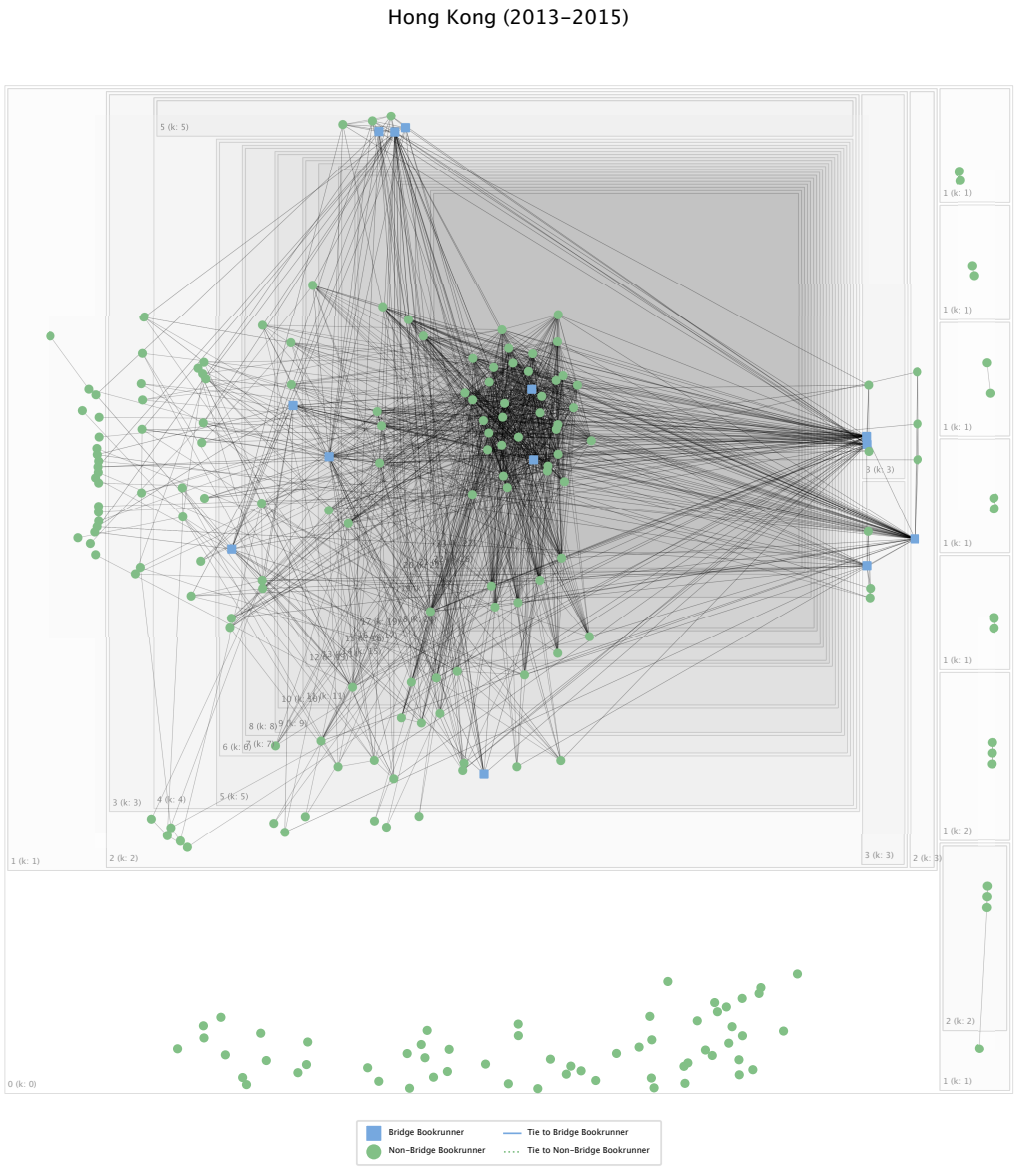

Figure 2a: Cohesive blocks of bookrunners in Hong Kong, 2013-15

Hong Kong (2013-2015), Core Network

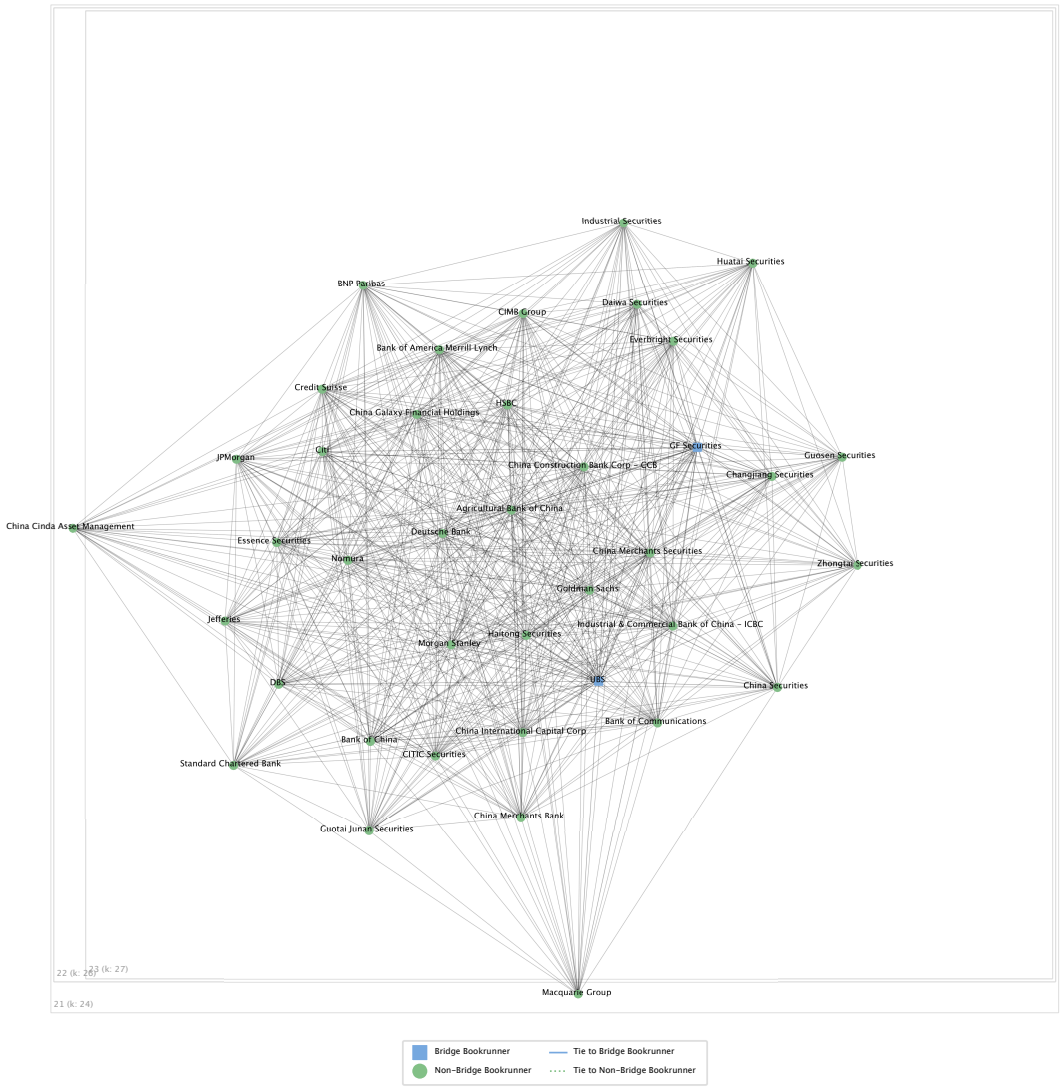

Figure 2b: Core of bookrunner networks in Hong Kong, 2013-15

Table 2: Weighted betweenness centrality rankings, Hong Kong and Singapore, 2013-2015

Rank	Hong Kong	Singapore
1	Huatai Securities	DBS
2	Industrial Securities	HSBC
3	China Merchants Bank	Citi
4	Quam Securities	UBS
5	Emperor Capital Group	Standard Chartered Bank
6	VMS Investment Group	Credit Suisse
7	Haitong Securities	CIMB Group
8	GF Securities Co	Goldman Sachs
9	Guotai Junan Securities	UOB
10	BNP Paribas	RHB Capital

Note: Betweenness centrality as weighted by deal value. The figures for Japan are not reported as betweenness centrality contains little information for the case of a clique.

Source: Authors' calculations based on Dealogic data

The weighted betweenness centrality measures in Table 2 provide further evidence of the prominence of local and Chinese financial intermediaries.[10] The top 10 firms are almost all Hong Kong or Chinese investment banks, which signal their more powerful positions in ECM networks with rich information and financial resources, ability to generate stronger demand and reduce uncertainty around equity issues, and influence other underwriters. We expected some of the largest Chinese investment banks to be important in ECM networks since large volumes of ECM activities in Hong Kong are generated by Chinese firms (with domestic listings accounting for almost 95% of the Hong Kong Exchange). However, their prominence and the number of banks identified have exceeded our expectations. As the capital needs of mainland Chinese firms continue to grow with domestic and overseas

[10] The figures for Japan are not reported as the core group is a clique, meaning every bookrunner is connected to every other bookrunner. Hence, every bookrunner is as central as other bookrunners in the clique, even when transaction values are taken into account. For mathematical details, please see Wasserman & Faust (1994).

expansion, this could mean increasingly important roles for local and regional banks in Hong Kong's ECM network and a potential challenge to the roles of North American and European bulge-bracket banks in Hong Kong.

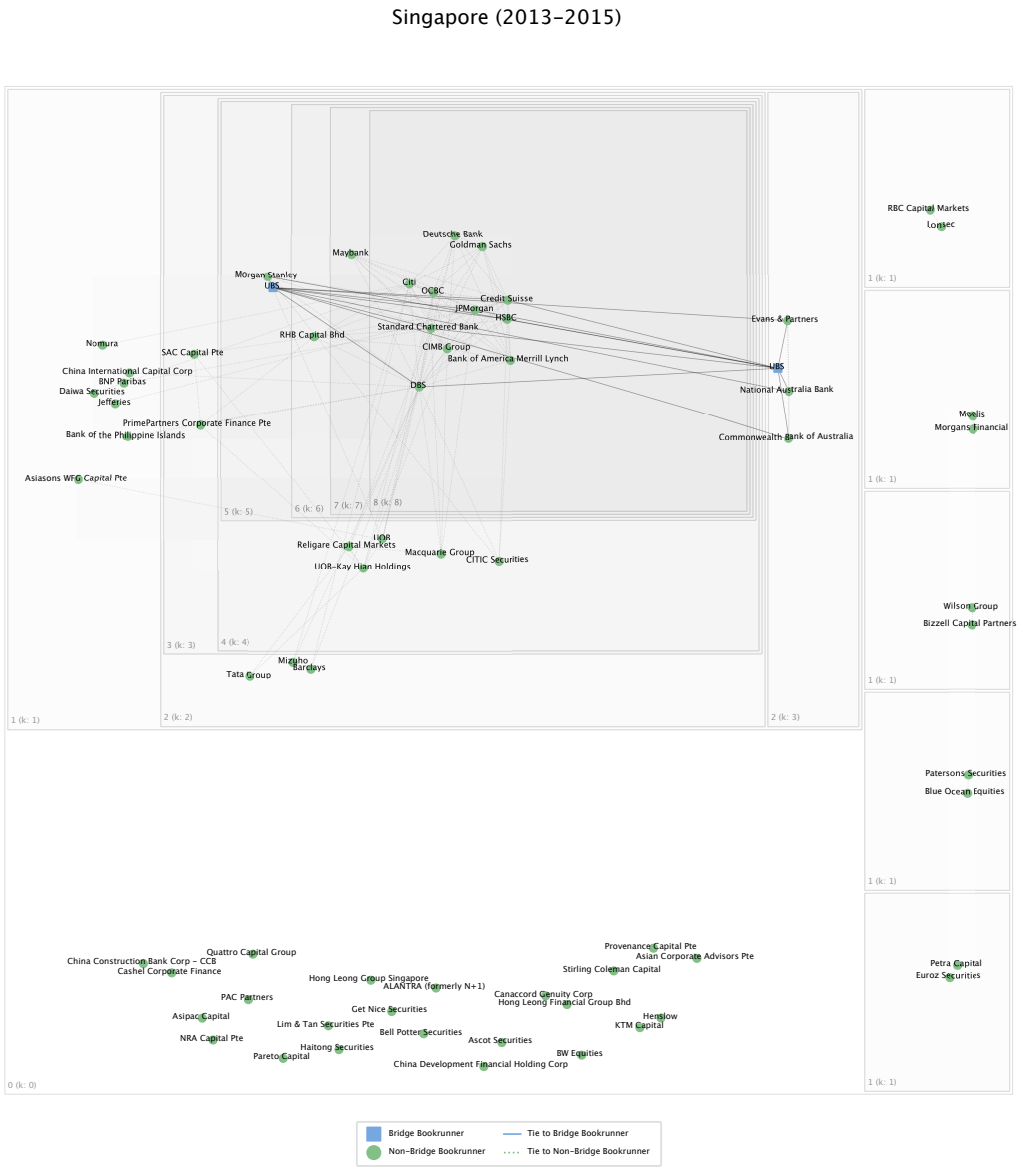

Figure 3: Cohesive blocks of bookrunners in Singapore, 2013-15

We observe a less differentiated financial network in Singapore (Figure 3). The inner core (level 8) consists of many global bulge-bracket banks; their centrality in Singapore's

equity networks is unsurprising given that they account for 77.74% of all ECM deals (by value). However, Singaporean and Malaysian banks (e.g., DBS, OCBC, and CIMB) are also significant in the inner block. This is also reflected in betweenness centrality rankings with these banks strongly represented and DBS topping the list (Table 2). The important positions of both bulge-bracket and local banks can be traced to the evolution of Singapore's banking sector since the banking reforms of 1999-2004. The banking liberalisation measures increased participation of foreign banks in Singapore and led to growing sophistication in investment banking activities. At the same time, competitive pressures pushed local banks into seeking M&As to enlarge their capital base, and seek other revenue streams in capital market activities rather than traditional loans and trade finance (Lai & Daniels, 2017). Given the relatively small domestic ECM market (having 63% domestic listings, compared with 99% in Japan and 94% in Hong Kong), regional opportunities presented by growing economies in the region, such as Malaysia, Indonesia, Thailand, Vietnam and India, become particularly important in shaping firm strategies. This led to aggressive regional expansion and hiring sprees by Singaporean and Malaysian banks in recent years (interviews: SG2, SG4, SG8, June-July 2016). Earlier banking reforms and the regional economic environment thus explains the central positions of local banks in Singapore's ECM network, even if they do not dominate the industry in terms of deal value.

In terms of overall industry structure, we find the greatest concentration of power in Japan, followed by Singapore, with Hong Kong having the most heterogeneous structure and competitive industry in comparison. The concentration of ECM transactions among a small number of investment banks in Japan reflects the historical legacy of banking regulation and the power of Japanese mega-banks. With a limited domestic market in Singapore, the growing Southeast Asian market is vital for investment banking activities and helps explain the prominent positions of Singaporean and Malaysia banks in such networks. Although the

Hong Kong market has strong domestic orientation, the sheer size of the ECM sector and the liberalised banking environment enabled a wide range of investment banks to capitalise on different firm characteristics (e.g., bulge-bracket or boutique banks, specific industry specialisation, domestic or globally oriented) to develop different market niches and survive in a highly competitive environment.

Global bulge-bracket banks are prominent in the ECM networks of all three economies, accounting for 76-78% of ECM deal value in Singapore and Hong Kong, and 63% even in Japan where large domestic players are powerful. However, our analysis of structural embeddedness and centralisation reveals the importance of local and regional investment banks, with different types of banks in positions of power and centrality in each location. In general, bulge-bracket banks from North America and Europe dominate the ECM segment in terms of total deal value, especially for deals that involve cross-border listings or targeted at international investors. However, analysing ECMs based on *network structures* reveal different patterns of centrality and embeddedness, which in turn indicates considerable variation in the distribution of power among different investment banks. The developmental trajectories and regional context of the leading Asian IFCs shed light on the observed distribution of power among different investment banks.

CONCLUSION

Investment banks are widely seen as highly globalised institutions, with bulge-bracket banks (mostly from the USA and Europe) seen as key actors in facilitating flows of capital across borders. In this paper, we have examined whether their financial networks within IFCs follow similar patterns in terms of how power is distributed among different types of investment banks. Our findings show considerable variation in the distribution of power and structure of investment banking networks within IFCs. In Singapore, we find bulge-bracket as well as

many Singaporean and Malaysian investment banks at the most powerful positions in financial networks, as the result of the latter's aggressive expansion into regional markets in recent years. In Japan, domestic mega-banks dominate alongside a handful of prestigious bulge-bracket banks. In Hong Kong, bulge-bracket firms are well established but a surprisingly large number of Chinese investment banks prove to be powerful in underwriter networks, especially as bridge bookrunners in connecting different firms. We have shown that the distribution of power among different banks in different IFCs—measured through positions in cohesive blocks—aligns with theoretical expectations regarding the important role of developmental trajectories and regional context in shaping the structure of financial networks in IFCs. While our empirical findings are based on the 2013-2015 period, analysis for longer and shorter periods (2012-2015 and 2014-2015) also yield similar results, which shows that findings in this paper are fairly robust. That being said, our analysis is static in that we do not study change over time in these financial networks. Such financial networks are highly dynamic and the examination of how they change over time stands as an important and largely unexplored area of research, particularly for rapidly growing economies in Asia. We hope that the analysis in this paper paves the way for further longitudinal investigation.

Our key findings highlight the importance of local trajectories and regional dynamics in shaping industry structures. They also point to increasingly powerful roles for local and regional investment banks in Asia, which could have future implications for organisational strategies and industry networks of investment banks (Knight & Wójcik, 2017). For local and national authorities, such findings based on network structures underline the importance of network positions (rather than just firm size or deal value) in assessing the roles and influence of different types of investment banks (in terms of access to information, resources and partnerships). Such an analysis could also be applied to other advanced business services, which are key business partners of investment banks, in understanding cities as 'strategic

places' in the global economy (Taylor et al., 2014). Strategic cities are not only sites through which finance and ABS firms perform their roles as global network makers, they constitute vital nodes where these firms have to be, in order to tap into the right mix of capital, knowledge, markets and network opportunities. As such, our findings further develop Taylor et al.'s (2014) arguments regarding the variegated 'strategicness'of cities as different financial centres present varied opportunities to investment banks, due to local industry network structures, historical contexts, regulatory changes and regional characteristics. This paper therefore goes beyond analysing IFCs in terms of networks *between* these nodes (which has been well established in world city network studies) to show how relationships *within* IFCs can reveal richer insights into the work of investment banks and positioning IFCs as differentiated markets (Lai, 2012).

Recent work by urban and financial geographers have noted the rising importance of Asia in world city networks and investment banking activities (Derudder & Taylor, 2016; Wojcik et al., 2018). Through the ECM networks of investment banks within these IFCs, our analysis extend those broad observations and present evidence of differentiated financial hubs in Asia. The theoretical perspective and empirical techniques we have adopted in this paper reveal that the seemingly global nature of investment banking hides a complex interplay between the global and the local, and that further research on financial networks within IFCs is necessary to understand the dynamic and variegated landscapes of global finance.

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APPENDIX

DATA CONSTRUCTION PROCEDURE

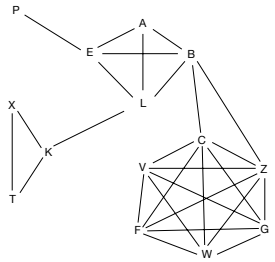
Our social network data are based on the raw transactions in the Dealogic database. The financial intermediaries who broker a deal as a sole bookrunner appear as isolated nodes in our analysis and a tie represents firms who jointly broker a deal. When financial intermediaries occupy a role as a bookrunner, lead manager, or global co-ordinator in the same transaction (see Figure A1a), this implies that the firms interact for an extended period of time in financing, exchanging information, and gathering interested investors to finalise a transaction. A deal with multiple financial intermediaries who act as bookrunner, lead-manager, or global co-ordinator will be represented by multiple ties among the different intermediaries. We use this information to build the accompanying adjacency matrix (see Figure A1b) where a 1 in a cell indicates the presence of a tie. Empty cells indicate the absence of a tie. Taken together, the adjacency matrix (or socio-matrix) represents the distribution of ties among financial organizations. Figure A1c illustrates the social network built from the pattern of transactions in Figure A1a.

	Bookrunner	Lead Manager	Global Co-ordinator
Deal 1	A, B	E, L	
Deal 2	C, V, Z, F	G, W	
Deal 3	C	B	
Deal 4	Z	B	
Deal 5	K	X	T
Deal 6	K		L
Deal 7	E		P

(a) Transaction Data

	A	B	C	E	F	G	K	L	P	X	T	V	W	Z
A		1		1				1						
B	1		1	1				1						1
C		1			1	1						1	1	1
E	1	1						1	1					
F			1			1						1	1	1
G			1		1								1	1
K								1		1	1			
L	1	1		1			1							
P				1										
X							1				1			
T							1			1				
V			1		1									1
W			1		1	1								1
Z		1	1		1	1						1	1	

(b) Adjacency Matrix



(c) Financial Network

Figure A1: Social network analysis

COHESIVE BLOCKING

In what follows, we assume an undirected and simple graph *G*, which consists of the set *V* of vertices and set *E* of edges. In the case of social network analysis, vertices are actors and edges are relations between the actors in the network. The set *E* of edges consists of unordered pairs of distinct vertices. The order of a graph G is defined as the number of vertices in of *G*. If *G* is of order 1, it is called a trivial graph. We do not consider empty graphs. A path in *G* is a sequence of vertices and edges where all vertices and edges are distinct. *G* is connected if there is a path between all distinct vertices; it is disconnected otherwise. For instance, the graph in Figure A2 is disconnected, since there is no path connecting nodes *P* and *B*. If *G* is disconnected and if it is not a trivial graph, its components consist of the set of nodes that can be connected by a path (Diestel, 2005; Harary, 1969; Wasserman & Faust 1994). The graph in Figure A2 has two components: {P, R, S} and {A, B, C, D, E, F, G, H, I, J, K, X, Y, Z}.

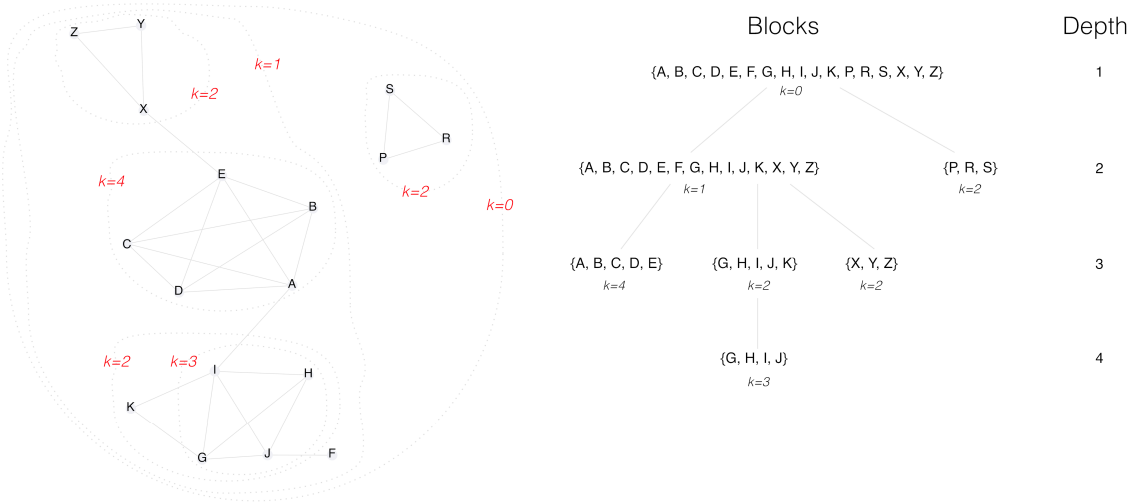


Figure A2: Cohesive blocking procedure

Cohesive blocking is a social network analysis technique combining two key notions in sociological theory: social cohesion and embeddedness (Granovetter, 1985; Moody & White, 2003). The technique rests on the notion of *k-connectivity*, which is defined as the minimum number of vertices that should be removed to make a graph disconnected or trivial (Harary, 1969, pp. 45-46). For instance, the component consisting of vertices {P, R, S} and the edges {(P,R), (P,S), (R,S)} will result in a trivial graph if any two of its vertices are removed. Thus, this particular component is said to be 2-connected ($k = 2$). In general, a *k*-component is any component of a non-trivial graph *G* that will be disconnected after the removal of *k* nodes.

The graph-theoretic notion of connectivity provides a solid basis for measuring social cohesion thanks to Menger's theorem. Menger's theorem states that the *k-connectivity* of a graph is equivalent to the number of disjoint paths connecting any two vertices in the graph (Harary, 1969, p. 47). This famous theorem is applicable to understanding social networks as it states that the structural cohesion of a social network is equivalent to the distinct relations that hold a network together (Moody & White 2003, p. 109).

Furthermore, the notion of *k-connectivity* can be employed to examine levels of embeddedness in a social network because of the recursive nature of *k-connectivity*. Each *k-component* in a graph *G* may contain components at the same or different levels of *k-connectivity.* For instance, the graph illustrated in Figure A2 has four levels of embeddedness. The first level consists of all the nodes in the network and has *k* equal to 0 as the graph is disconnected. In the second level, this graph has two components, one of which is 1-connected and the other is 2-connected. In the third level, the 1-connected component of level 2 features three components, which are 4-, 2-, and 2-connected. Finally, in the fourth level of embeddedness, we have the component {G, H, I, J}, which 3-connected.

Moody & White (2003) develop a recursive algorithm to identify the different levels of embeddedness in a network. Their algorithm builds on Kanevsky (1993), who combines Even-Tarjan reduction (Even & Tarjan, 1975; Even 2012) with Provan-Shier paradigm (Provan & Shier, 1996) for listing all minimum (s,t)-cutsets to generate all minimum-size separating vertex sets. In this paper, we follow Moody & White (2003) algorithm as implemented in the graph analysis software package *igraph* (Csárdi & Nepusz, 2006). Our implementation slightly diverges from the *igraph* package, and the particular algorithm we implement are available as pseudocode or as C-language source from the authors upon request. As the algorithm is highly technical, we refer the interested reader to the publications listed above, in particular, Moody & White (2003) and Kanevsky (1993).

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